

Notice of Allowability

Application No.

10/785,500

Examiner

Joseph Schell

Applicant(s)

HAAGENS ET AL.

Art Unit

2114

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment filed 9/27/07.
2. ☒ The allowed claim(s) is/are 1-9, 11-17, 19-26 and ~~29~~ 30.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

REASONS FOR ALLOWANCE

The following is an examiner's statement of reasons for allowance: Within Claim 26 the examiner deems the novel limitation to be, within the claim as a whole, that the derivation of task ordering is done using the claimed switching events.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an email from Ken Koestner on December 6th, 2007 with the exception of the amendment of line 1 of Claim 25 which was approved over the phone by Ken Koestner on December 10th, 2007.

Please amend Claims 1, 11 and 20-26 as follows:

1. A device capable of usage in a storage system including an initiator, a primary target, and a secondary target, the device being capable of configuration for asynchronous remote mirroring functionality and comprising:

a target controller capable of communicating with the initiator and performing operations requested by the initiator; and

a process on the target controller capable of receiving a stream of command requests from the initiator, performing the requested commands, and asynchronously relaying the requested commands to a secondary target while ensuring precedence graph equivalence between received and relayed commands, the process tracking outstanding write tasks, ~~marking transitions in number of outstanding write tasks with task attributes~~, marking write tasks with task attributes according to changes in number of outstanding write tasks, and embedding task attributes in the relayed commands capable of increasing concurrency in commands performed by the secondary target, wherein the target controller is a Small Computer Systems Interface (SCSI) device and the task attributes are SCS/task attributes including Simple, Ordered, Head of Queue, and Auto Contingent Allegiance (ACA) task attributes.

11. A method of ordering commands in a communication system comprising:

receiving a stream of commands; performing the commands;
relaying the commands to a target;
tracking outstanding write tasks;
~~marking transitions in number of outstanding write tasks with task attributes~~;
marking write tasks with task attributes according to changes in number of outstanding write tasks; and

embedding the task attributes in the relayed commands to increase concurrency in commands performed by the target wherein the task attributes are SCSI task attributes including Simple, Ordered, Head of Queue, and Auto Contingent Allegiance (ACA) task attributes; for operation in a Small Computer Systems Interface (SCSI) device.

20. A method of ordering Commands in a communication system comprising:

communicating information via an internet Small Computer Systems Interface (iSCSI) transport protocol;

tracking outstanding write tasks;

marking transitions in number of outstanding write tasks with Small Computer Systems Interface (SCSI) task attributes; and

embedding the Small Computer Systems Interface (SCSI) task attributes in a received command stream to ensure an ordering behavior sufficient for attaining concurrency performance and correct algorithm operation.

21. A method of ordering commands in a communication system comprising:

receiving a stream of command requests;

relaying the requested commands;

tracking outstanding write tasks;

~~marking transitions in number of outstanding write tasks with task~~
attributes;

a code that causes the controller to embed task attributes in the relayed commands according to the intended precedence to increase concurrency in commands performed by the target wherein the task attributes are SCSI task attributes including Simple, Ordered, Head of Queue, and Auto Contingent Allegiance (ACA) task attributes.

23. An article of manufacture comprising:

a tangible computer-readable medium having a program code for execution on a controller **embodied stored** therein for ordering commands in a communication system, the program code further comprising:

a code that causes a controller to communicate information via an internet Small Computer Systems Interface (iSCSI) transport protocol;

a code that causes the controller to track outstanding write tasks;

~~a code that causes the controller to mark transitions in number of outstanding write tasks with task attributes;~~

a code that causes the controller to mark write tasks with task attributes according to changes in number of outstanding write tasks; and

a code that causes the controller to embed Small Computer Systems Interface (SCSI) task attributes in a received command stream to ensure an ordering behavior sufficient for attaining concurrency performance and correct algorithm operation.

marking write tasks with task attributes according to changes in number of outstanding write tasks; and

embedding the task attributes in the relayed commands to improve transaction ordering for a remote mirroring application using an ordered transport wherein the task attributes are SCSI task attributes including Simple, Ordered, Head of Queue, and Auto Contingent Allegiance (ACA) task attributes.

22. An article of manufacture comprising:

a tangible computer-readable medium having a program code for execution on a controller **embodied stored** therein for ordering commands in a communication system, the program code further comprising:

a code that causes the controller to receive a stream of command requests;
a code that causes the controller to perform the requested commands;
a code that causes the controller to infer an intended precedence of the requested commands;

a code that causes the controller to relay the requested commands to a target;
a code that causes the controller to track outstanding write tasks;
~~a code that causes the controller to mark transitions in number of outstanding write tasks with task attributes;~~

a code that causes the controller to mark write tasks with task attributes according to changes in number of outstanding write tasks; and

24. An article of manufacture comprising: a tangible computer-readable medium having a program code for execution on a controller **embodied stored** therein for ordering commands in a communication system, the program code further comprising:

a code that causes a controller to receive a stream of command requests; a code causing that causes the controller to relay the requested commands;

a code that causes the controller to track outstanding write tasks;

~~a code that causes the controller to mark transitions in number of outstanding write tasks with task attributes;~~

a code that causes the controller to mark write tasks with task attributes according to changes in number of outstanding write tasks; and

a code that causes the controller to embed task attributes in the relayed commands to improve transaction ordering for a remote mirroring application using an ordered transport wherein the task attributes are SCSI task attributes including Simple, Ordered, Head of Queue, and Auto Contingent Allegiance (ACA) task attributes.

25. A **storage** device in a communication system comprising:

means for receiving a stream of command requests;

means for performing the requested commands;

means for relaying the requested commands to a target;

means for tracking outstanding write tasks;

~~means for marking transitions in number of outstanding write tasks with task attributes;~~

means for marking write tasks with task attributes according to changes in number of outstanding write tasks; and

means for embedding task attributes in the relayed commands capable of increasing concurrency in commands performed by the target wherein the task attributes are SCSI task attributes including Simple, Ordered, Head of Queue, and Auto Contingent Allegiance (ACA) task attributes.

26. A remote mirroring method comprising:

communicating information between a primary initiator and a secondary target;
inferring a task precedence graph intended by the primary initiator by tracking concurrency of issued tasks;

conveying the inferred task precedence graph to the secondary target; and
sensing the inferred task precedence graph by tracking transition points dependent on ordering of commands in a command stream

wherein tracking transition points further comprises **tracking of switching events comprising:**

switching at a first transition point from a multiple outstanding write task condition to a no outstanding write task condition; and

switching at a second transition point from one or fewer outstanding write tasks to multiple outstanding write tasks.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Schell whose telephone number is (571) 272-8186. The examiner can normally be reached on Monday through Friday 9AM-4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Scott Baderman can be reached on (571) 272-3644. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JS


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